Design of Pillars of Temples of India

Thesis submitted for partial fulfillment of
the requirement for the degree of

BACHELOR OF TECHNOLOGY

in

Industrial Design

by

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CERTIFICATE

This is to certify that the Project entitled **"Design of Pillars of Temples of India"** is submitted by **Vishal** (Roll No. 110ID0547) in partial fulfilment of the requirements for the award of Bachelor of Technology degree in Industrial Design at the National Institute of Technology, Rourkela is an authentic work carried out by him under my supervision and guidance.

To the best of my knowledge, the matter embodied in the thesis has not been submitted to any other University/Institute for the award of any Degree or Diploma.

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"KNOWLEDGE IS INCOMPLETE WITHOUT MOTIVATION AND DIRECTION"

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ABSTRACT

Pillars or column is one of various types of standing upright, load-bearing architectural members. In history, when man has sought to enclose area, supports have been a major part in buildings, from huts to eminent monuments. Already before historic times it was known that such supports were less likely to fall in bad weather if they were inserted into flat stones and that, if the gaps were left at the top, they would give more stability for the roof. That's why, the pillar base was presented and the improvement of the capital prefigured. Pillar is an equipment or a thing in civil, architectural and structural engineering which is used to transmit load from one part of the structure to another part of the structure. It is a compression member used for this purpose and keep the building straight. In architecture, "pillar" is a part of structure which also have a decorative and structural properties. A pillar may also be an element for decoration not support and structural purposes; many pillars are "engaged", i.e. they make a part of the structure wall. Design of any product require research and study of the things related to particular product. It is research on most types of pillar existed in history of Indian or Western culture and architecture. Study of different types of order present in western architecture and Parts and nomenclature of pillars are here. This research analyzed the columns or pillars as a vital part or element in architecture, aesthetic design and interior design of building, monuments and structures. In present time also pillars are an integrated part of our design, art and architecture in people life. The research include the evolution, development and alteration done on pillars time to time by various groups. CAD models is to be generated using CATIA keeping all the attributes and factors in mind and CAD model is then further be used for rapid prototyping and a prototype of the structure having all the pillars under one roof is generated using 3D printing method.

Key words: *pillar, column, architecture, temple, culture, symbol, interior, roof, Indian architecture, orders, western.*

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LIST OF ABBREVIATION USED

TH= Total Height

BH= Border Height

SC= Shaft Circumference

BH= Border Circumference

SH= Shaft Height

BH(U)= Upper Border Height

BH(B)= Bottom Border Height

BC(U)= Upper Border Circumference

BC(B)= Bottom Border Circumference

BH(M)= Middle Border Height

BH(MB)= Border Height of middle border

BC(MB)= Border circumference of middle border

CHAPTER 1
INTRODUCTION

Pillars or column is one of various types of standing upright, load-bearing architectural members. In history, when man has sought to enclose area, supports have been a major part in buildings, from huts to eminent monuments. Already before historic times it was known that such supports were less likely to fall in bad weather if they were inserted into flat stones and that, if the gaps were left at the top, they would give more stability for the roof. That's why, the pillar base was presented and the improvement of the capital prefigured [1].

Pillar is an equipment or a thing in civil, architectural and structural engineering which is used to transmit load from one part of the structure to another part of the structure. It is a compression member used for this purpose and keep the building straight. In architecture, "pillar" is a part of structure which also have a decorative and structural properties. A pillar may also be an element for decoration not support and structural purposes; many pillars are "engaged", i.e. they make a part of the structure wall. Other definition of pillar is a tall perpendicular structure made of stone, wood, or metal which is used as a backing for a building, or as an ornament [2].

1.1. History:

Pillars has been used in a good amount in Iron Age civilization of near east and Mediterranean for the purpose of load bearing and as a compression member. Stone pillars were also used in prehistoric Egyptian architecture and after that i.e. later Egyptian faceted columns or pillars were used very much.

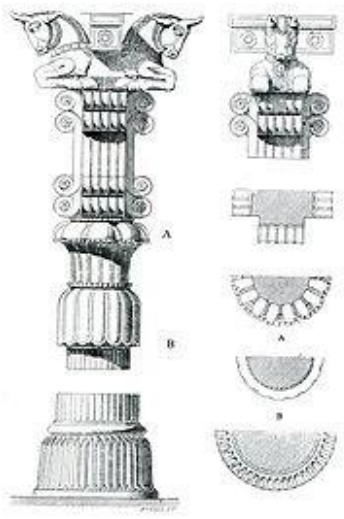

Fig 1. 1 Persepolis pillar, of Persia (Iran), front view and side view [1]

In history, the richest and aesthetically best pillars has been and in them some were from time of Persians, and Persepolis are one of them which were very huge and classic. The construction of their capital was amazing including the technique of double-bull. Due to their interest in the architecture and art, Darius I, Achaemenid king made a hundred pillar hall which is a Persepolis. The Persian pillars are very tall and huge and some are more than thirty meters.

The main purpose of Egyptians and Persians to use pillar was to support the roof of building and they made the visible part of pillar to look great. However Greeks used them as an interior and exterior architecture which was property of traditional architecture e.g. Parthenon. Classical orders i.e. Ionic, Corinthian etc. are due to Greeks and Roman who followed it after them gave birth to Tuscan orders and Composite orders.

In middle ages, Pillars were not developed and worked on so much and different types of architecture like Byzantine and Romanesque retrained classical shapes and orders to use it more flexibly. [1].

Fig 1.2 A Photograph of Temple of Apollo in Delphi [1]

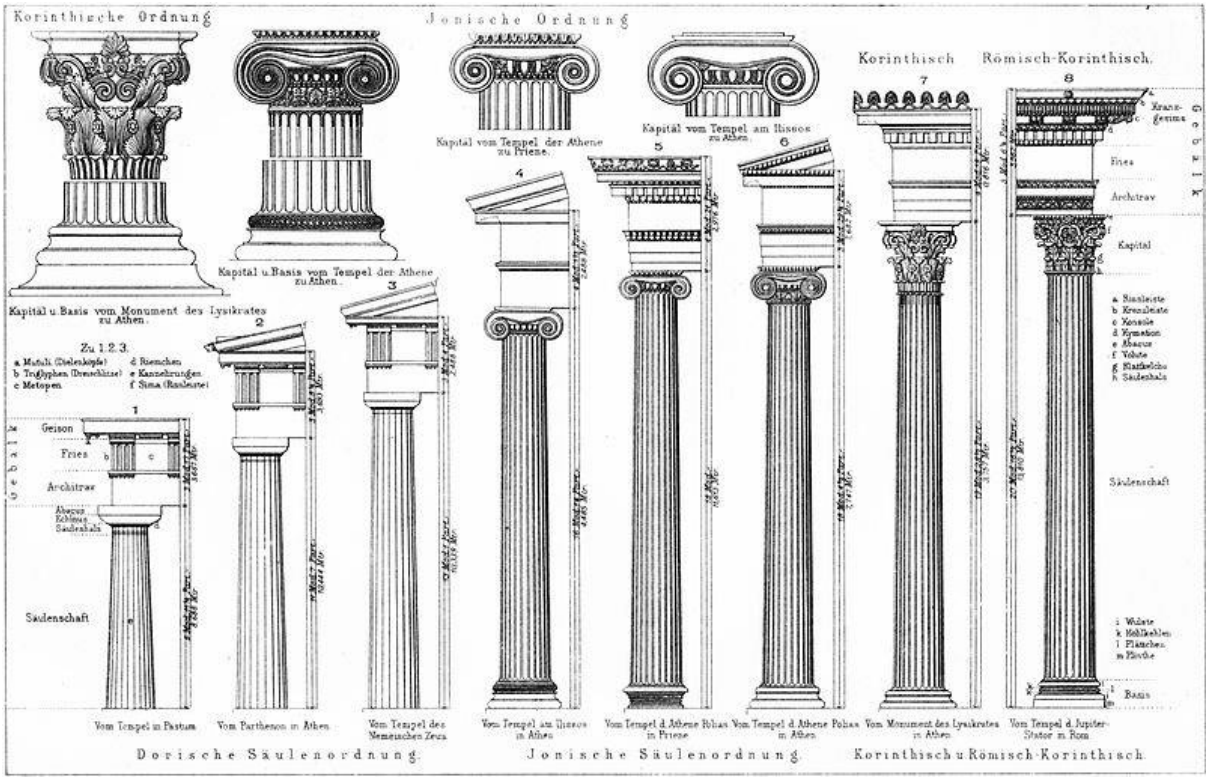

Fig 1.3 A brief illustration of classical orders; The Doric pillars (first 3), The Ionic pillars (next 3) and The Corinthian pillars (final 2) [1]

CHAPTER 2
LITERATURE REVIEW

2.1 Classical order:

One of the type of classical architecture is Classical Order and it is very well known by its very easily recognizable and famous pillars types and their structures. During Greece time, three orders were initiated which are Ionic order, Doric order and Corinthian Order. After that Roman followed them and introduced new order i.e. Tuscan order; better and simpler than previous one and more aesthetically designed [3].

2.1.1 Greek Order:

Greek orders are of three types: Doric, Ionic and Corinthian order. There three orders were developed by Greece people and then later continued with Roman. Roman then developed them and improved more in respect of aesthetic and visual aspects. They worked on their capital which is an important part of a pillar or column. This occurred in First century BC. After that, these Greek order have been used in Europe continuously in their architecture. Doric order is considered to be the oldest order in all of them however there is no proof to this belief and Doric and Ionic both order were started in wood which is also a belief [4].

2.1.1.1 The Doric order:

Doric order is the neatest and cleanest of all the order which shows its very simplicity and we can also take it to be an example of minimal design. These pillars are not so long i.e. they are short and they have heavy pillars and lack base in them. These were started in western Greece and mainland. The ration between height and its diameter is 4:1 to 8:1. In it Necking forms the capital and as earlier said since it is a very simple order so capital is very simple. The parts in it which are Echinus and abacus are convex and square respectively.

The important part of pillar which is Entablature is made of 3 straight horizontal parts. The capital is having a part above it which is called abacus and abacus is square which links capital part to entablature. So it also act as a linking part.

Doric order were mainly for the purpose of load bearing and compression bearer rather than artificial purpose of only aesthetics and this is the reason they were made of this shape that the width or the diameter of the pillar was very much as compared to the height of the pillar. They were mainly used on the places which need more support than the usual requirement.

The Romans then worked on this pillar and they made a lighter looking pillar than earlier Doric order. Roman decreased the proportion of the pillars. The original and real Greek order do not have base and are directly made stood [5].

2.1.1.2 The Ionic order:

Ionic order were of more height than Doric order. The birthplace of this order is called Greece (eastern). Other order named Aeolic order which was not so famous has some similarities with is. The main features which makes ionic order unique are its lean pillar with shape of flute and having a big base and other specifications in volute i.e. 2 volute which are opposed in part of pillar named echinus. The number of flutes in Ionic order pillars shaft are four more than the Doric pillar shaft. The tapering is present on the shaft of the pillar which make is easily recognizable. As earlier said it has more height and diameter proportion than Doric order. Hence the ratio of lower diameter and height is 1:9. There are imprinter arts which works as ornaments on it [6].

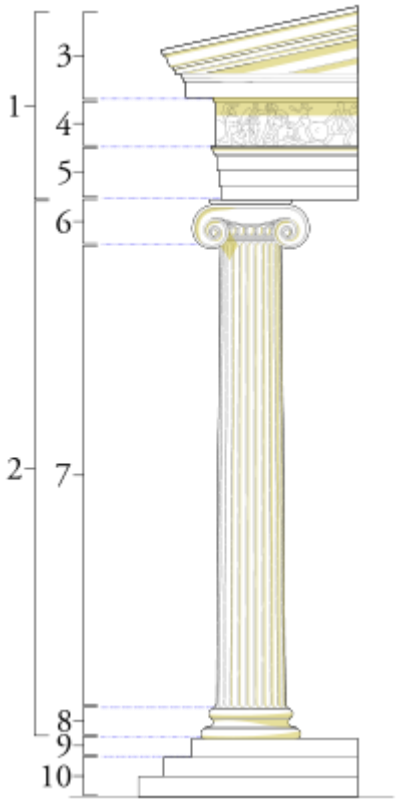

Fig 2.1 Different Parts of the Ionic order: 1 - entablature, 2 - pillar, 3 - cornice, 4 - frieze, 5 - architrave or epistyle, 6 - capital (composed of abacus and volutes), 7 - shaft, 8 - base, 9 - stylobate, 10 – krepis [6]

2.1.1.2.1 Capital:

Because of Vitruvius is not a very clear passage so on the basis of that, the biggest assets which is very practical and theoretical of Ionic order are the volutes of its capital. Vincenzo who is the Architect and theorist of Renaissance, he designed a form of such a flawlessly four-sided the Ionic capital in 16th century [6].

2.1.1.2.2 Pillars and Entablature:

Ionic is more thicker than Doric. The diameter of Ionic pillars is about eight and nine meter, and it is possible also that it is more than it of American Late Greek revival plantation houses which is the antebellum colonnades. Well, Mostly the Ionic pillars are fluted. The difference between a Roman fluting and a Greek fluting is that in 1st one a small surface is left between each hollow thing and vice versa in second. [6].

2.1.1.3 The Corinthian order:

There are three orders in Greek orders and Corinthian is one of them and is considered to be the most decorative and ornamented in all of them. The properties and specifications of this type are its lean flutes and the capital is richly ornamented. Between all the three orders which were present in Greece, Corinthian is believed and considered to be the neatest, simple and elegant order. Other specification present in it is its Shaft which is having 24 flutes. The height and the diameter are in the ratio of 10:1. Various literature have mentioned about its extraordinary appearance and looks in which one of them was Vitruvius. Pillars of this orders are well known for its neat and elegant designs and arts on them. So, the main thing is, in this order the balance of neat and elegant with the rich decoration and ornament is perfect and impressive [7].

2.1.1.4 Roman Orders:

Roman used the Greek orders very well to develop their own designs and orders which were two. So we can say they did some more changes in Greek Orders, combined their properties or developed them according to their use. The main feature and specification about that time was, they developed superimposed order i.e. applying different types of orders in one building or monuments at different levels. Suppose they will place Ionic order at bottom i.e. ground floor and Doric one on 1st floor and so on. However according to their use, designs and architecture they used heavy weight orders at bottom and lighter on above that and so on and lightest was on the top floor. So, they placed Doric order on ground level and Ionic order was placed for

middle floor and Composite order pillars were used at top to support roof as they are lightest one.

2.1.1.5 Tuscan order:

From all the Roman orders Tuscan order is different and it has a basic concept and design. The capital of Tuscan order is plain and the shaft and base are simple. So, we can say that Tuscan is one order which follow and believe in simple and elegant design and architecture. The Romans adopted the Greek orders and Tuscan order is a developed simple version of Doric order. Roman were main focused on the application of pillar as load bearing and compression member. The shaft of Tuscan order do not have flute on it and Tuscan order also have a capital. The sizes, ratios and proportion are similar as Doric order. However it is more neat and simpler than Doric order. The ratio of the diameter to the height of this pillar is around 1:7. So, same as Doric order it look more tough and solid.

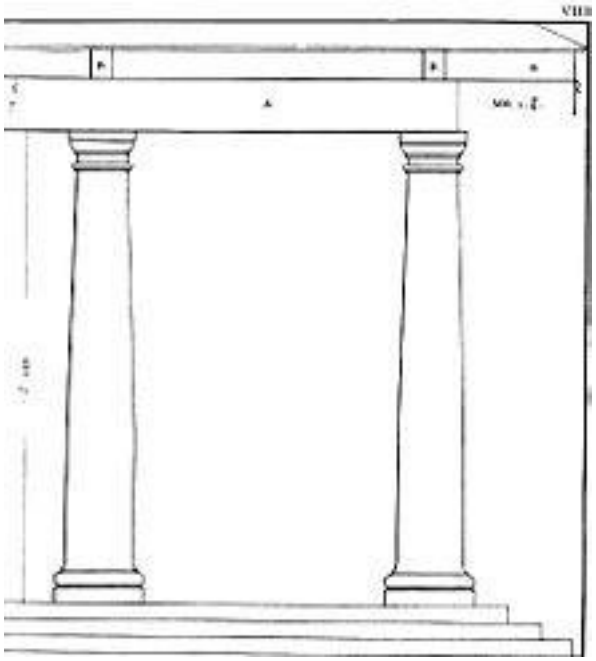

Fig 2.2 The Tuscan order in Andrea Palladio, Quattro Libri di Architecture, 1570 [8]

Due to its simple structure, it is easily operated by the carpenters and artists. So it became famous. For defining the structure of Tuscan order in simpler way, Tucson order is look like the Doric order. However the ratios and proportion matches with the Ionic order. As, earlier said, this order is more focused on the use and application rather than ornaments and carving,

it was mostly used to support heavy structure and was used in army and monumental places. [8].

2.1.1.6 Composite order:

Composite order as we can estimate with the name, it's a combination of other orders i.e. Ionic and Corinthian order. Initially it was not considered and classified as different or unique order. However, it was considered as the Roman altered version of Corinthian order. The look and appearance of the Composite order is very gentle and elegant. Hence due to its appearance, it was highly used in Church mainly in the church of Virgin Mary. The Ratio of Diameter to the height of the pillar is 1:10. So it was used in most of the female saint Church because of its gentle look [9].

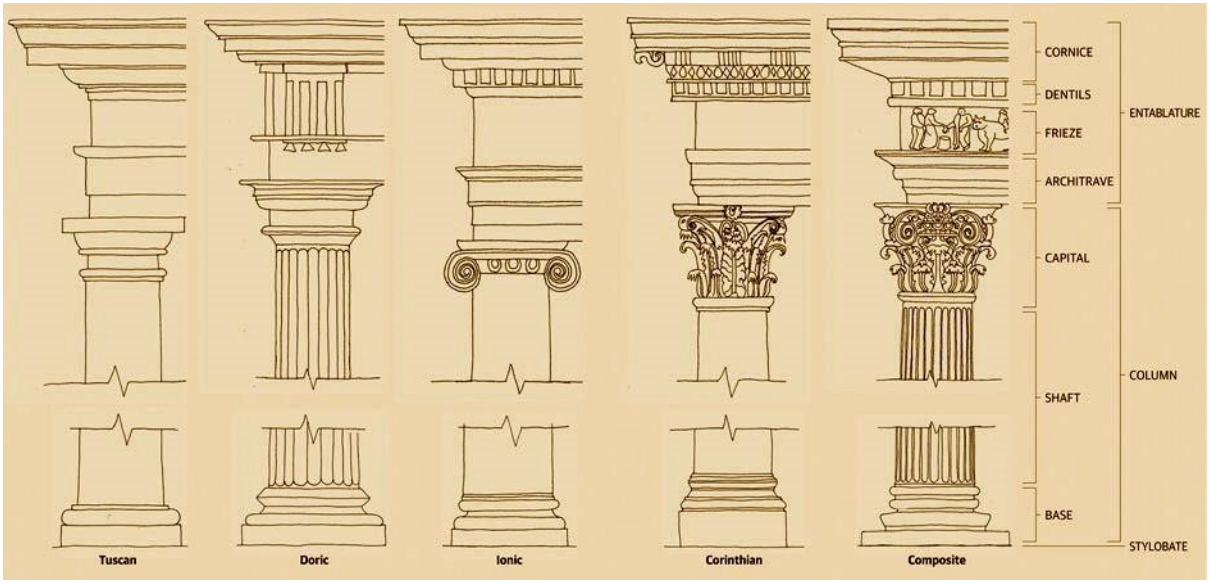

Fig 2.3 Various Parts of Pillar in Five main orders of pillar in architecture. [11]

2.2 Columns or Pillars in India:

Different from western culture, India is a very rich country in design, architecture and art. India has very prehistoric temples in it and these temples have very gorgeous and satisfactory art and architecture in them. Here below, a little and best of those art, architecture and pillars have been demonstrated.

2.2.1 Yali (Hindu Methodology)

In Hindu temples, a different animal or creature has been used which is sometimes thought to be a guard at gate of the temple. In most of the temples of South and East India part, we can

find this type of creature at almost every temple. One of these structure is Yali. The Yali has been made of different structure and body parts. In some cases it look like a body of cat and the head and face of lion and the nose of the elephant and the tail is sometimes look like snake.

Fig 2.4 Yali pillars, Rameshwara Temple,Keladi, Shivamogga District, Karnataka state, India [12]

Fig 2.5 Yali in Aghoreswara temple, Ikkeri, Shivamogga district, Karnataka state, India [12]

Almost all of the structure are made as 3D model which may be made of stone or some other material. However some time these creatures or animal have been found on the pillars which are carved on it to show a great art. Sometimes they are carved or painted on the wall. Yali is considered as the sacred animal which is very dangerous in look so makes it powerful and it is made using the body parts of other animals like lion, elephant, snake etc. It is mostly seen in the Tamil Nadu and South Indian Temples.

Yali has been an integrated part of the pillar in Indian history because of their carving on the pillars. The power of Yalis is considered to be so much more than the lion and the elephant. They have always increased the beauty and art of the pillars [12].

Fig 2.6 Yali pillars at Vittala temple at Hampi and Ananthasayana temple, Ananthasayanagudi, Karnataka, India [12]

Fig 2.7 Yali pillars at Bhoganandishvara temple in Cikkaballapur district, Karnataka, India [12]

2.2.2 Pillars of Ashoka:

All over the India, Ashok pillars are very famous and though as integral part of India. On Indian currency, these have been used. They are all over the north part of India. They were founded and made by the great King Ashoka in 3rd century when he was ruling. He must have founded numerous pillars, however the remaining are very less and are nineteen in quantity which are alive. Many of them are conserved in fragmented state. There average height is around forty to fifty feet i.e. 12 to 15 meter. The maximum weight is measured to be up to fifty tons each. These pillars were carried from a place where they were made and then established at another place. The distance they may have to cover for their transportation is up to 100 miles which is a very large amount. Buddhisht monasteries are the place where all these pillar were erected. There are writing for indication and lectures to nuns and monks. It is believed that pillar are made of 2 kinds of stones because they seem to be from Mathura and Chunar near Varanasi. The pillar which are from Mathura are red and white marked and the pillars which are from Chunar near Varanasi are black and dark spotted. After doing research, Scientists says that the style and art in pillars tell us that the work and carving on the pillar is done by same area

craftsman. It is believed that may be the stones were brought from Mathura and Chunar near Varanasi and then the craftsman did their work and art on them i.e. carving.

The quality of the pillar is that the shaft is very smooth, clean and simple and the cross-section is circular and the tapering is in upward direction and it is made of a single stone. The capitals below part has a shape and structure of bell shaped lotus structure. The masterworks of Mauryan art is the crowning creatures which looks like lion and it is either seating or is in position of standing there. It shows the pride and bravery of India. The Pillar of Ashoka are considered as a culture representation of India i.e. a symbol of bravery, pride and calm. Now, almost all other pillars lack the capital and the lion shaped creature due to degradation [13].

Fig 2.8 Front view of the single lion capital of Ashoka Pillar in Vaishali [13]

2.2.3 Iron Pillar of Delhi

The Iron pillar is located in Delhi near Qutub Minar. It is a very famous pillar in India due to its non-rusting property. It is a rust resistant pillar standing very firmly without any rust (every metal rusts) in such a rust creating environment of India. It is 23 feet in altitude. The archaeologists and metallurgists from India and outside India have been fascinated by its property and had done various research on it. This pillar proves the metallurgic and other skills of historic blacksmiths of India. The reason behind its corrosion resisting power is a coat of

crystalline iron hydrogen phosphate place on the iron which is having large amount of phosphorus on it. This works stop it to be effected by the climate and environment of Delhi [14].

Fig 2.9 Three views of Iron pillar of Delhi [14]

2.2.4 The Thousand Pillar Temple:

One of the greatest Indian pillar is Thousand Pillar Temple. It is a Hindu temple which is situated in Hanamakonda town in Telangana state, India. The temple is devoted to Hindu God Shiva, Surya and Vishnu. Kakatiyas made many temples in India during prehistoric time and Thousand Pillar Temple is one of the best and oldest in them. The work on it is a masterpiece and the architectural expertise has been applied to a great amount in it by Vishwakarma. The temple is made at one meter height from the ground. The belief is that this temple was made by the Rudra Deva, who was a king in 1163 AD. The temple is rich in the style and art of Kakatiyas work and is one of their best work.

The speciality and the main reason for it being so famous is that it has one thousand pillar in it and no pillar will stop you to view and watch the God from any part of the temple. The temple also have a statue of the Nandi bull which is considered to be devoted to Lord Shiva. The pillars are splendid and have great aesthetics engraving and carving on them. Due to the beutiful view and environment, many films has been shoot here.

2.10 Three views of The Thousand Pillar Temple and Pillars [15]

2.2.5 Angkor Wat:

This temple is one of the largest center for the pilgrimage all over the world. It was initially a Hindu Temple and then it became a Buddhist temple. Ankor Wat which is a pre historical temple was constructed or made by Suryavarman II, Khmer Emperor. Temples before the Ankor Wat were dedicated to Shiva. However it was dedicated to Vishnu which can be said a deviation from the old methodology before Suryavaram II. It was completed in initial 12th century in Yasodharapura which was the capital of the Khmer Reign. The best work of Khmer Architecture and art has been involved and shown here and Kalinga Architecture motivated

and inspired their work. The national Flag contains the sign of Cambodia which is quite fascinating for the tourists.

Initial Dravidian Architecture and Jagati these two tactics are included in Khmer architecture. The pillars in temple are having art and carving which are inspired from Kalinga arts and Dravidian arts. The Work which is done on the pillars of this temple is very neat and aesthetically sound. The placing of the pillars are done in such a way that it makes the temple look fascinating and powerful [15] [16].

2.11 Close View of Stone pillars at Angkor Wat [16]

2.2.6 The Sri Ranganathaswamy Temple:

It is a great Hindu temple and tourists come here every year in a great amount. Sri Ranganathaswamy Temple is a Hindu temple. Sri Ranganathaswamy Temple is dedicate and devoted to Hindu God Vishnu. The temple is in a small place named Srirangam which is in Tiruchirapalli, Tamil Nadu, India. This temple is believed to be the one of the sacred and is one of the most renowned Vaishnava temple. The size of the temple is very large and it is covered by 7 concentric walls which are called prakaram in Hindu and the dimension of the temple is over six miles i.e. 32592 feet. The people who are not Hindu are not allowed in the temple after second prakaram. However they cannot pass or get into sanctum sanctorum. This temple is known to have a great architecture used in its building and supports or pillars. The temple has adopted the style of Dravidian architecture. Island at Cauvery River is the place of its situation. The location is very dangerous for the temple in respect of natural disaster or tragedies and Muslim and European attacking people or armies. These people constantly

hijacked the place or island for the military purpose and campsite. The art on the pillars of temple is inspired from the Dravidian art and architecture. The engraving and ornaments on the pillars are gorgeous and impressive. The base and Capital of the pillars are neat and simple [17].

Fig 2.12 Hall of 1000 pillars with sculptures of riding horses [17]

2.2.7 Akshardham Temple:

Akshardham is one of the famous and well known temple in India. It is well known for its architecture, art and aesthetics approach in building this great temple complex or monument. It is situated in capital of India i.e. New Delhi near the Yamuna bank. The example of art and ornaments used in these temples are extraordinary which shows the history and culture of India and Hinduism. The pillars has been carved and engraved in such a way that they are very fascinating to the tourists. It was built and opened for public on 6th November year 2005. The temple is constructed of rocks and stone. The pillars made are showing the Indian culture and fascinating architecture of India. The temple is made using Vastu Shastra. It is believed that temple attracts around 7 out of every 10 tourists who visits Delhi. The temple is made with the help of approximately 7000 artists.

Fig 2.13 Four Views of Akshardham Temple, Delhi, India.

2.2.8 Meenakshi Amman Temple:

Meenakshi Temple is one of most famous and largest temple of India which attracts a very huge amount of tourists to it. The design, architecture and arts included in this temple are really impressive. It is a Hindu temple. It is also known as Meenakshi Sundareshwarar Temple and it is in Tamil Nadu's city named Madurai. It is situated on southern bank of Vaigai River. The temple is devoted to Hindu Goddess Parvathi who is also known as Meenakshi by Hindu and His Husband, Shiva and his name is also Sundareswarar. The temple is one of the very old and historic temple. The pillars used in this temple are the reason who are supporting it from ancient times. The strength and architecture of pillar is really appreciable. The carving and ornaments on pillars are great and an example of Indian ancient art. The temple contains around 33000 sculptures in it which is a very large amount in itself for a temple and it shows the capacity of art and aesthetics approach. The temple earns an annual income of around 60 million Rupees per year. This vast and huge temple is in an area of 45 acres. [18].

Fig 2.14 Pillars of Meenakshi Amman Temple [18]

CHAPTER 3

METHODOLOGY

On the basis of our objective and literature, I decide to do study on the temples situated in Rourkela, Odisha, India. I did study on the pillars or pillars of the temples of Rourkela and did analysis on them, theoretically and numerically. This analysis will help me to proceed further in my project efficiently.

3.1 Study on pillars of temples in Rourkela:

Below is the study on pillars of temples of Rourkela. I have taken all the details of all the pillars which are illustrated below.

Abbreviation used in measurements:

All measurements are in inches.

TH= Total Height

BH= Border Height

SC= Shaft Circumference

BH= Border Circumference

SH= Shaft Height

BH(U)= Upper Border Height

BH(B)= Bottom Border Height

BC(U)= Upper Border Circumference

BC(B)= Bottom Border Circumference

BH(M)= Middle Border Height

BH(MB)= Border Height of middle border

BC(MB)= Border circumference of middle border

Pillar 1: Sec-2 Devi Mandir

TH= 86 inches

BH= 8 inches

SC= 42 inches

BC= 50 inches

COLOR= yellow, orange, brown, red, white

Fig 3.1 Temple and Pillar 1

Pillar 2: Near sec-5 Temple

TH: 120 inches

BH= 32 inches

SH= 42 inches

BC= 50 inches

COLOR= sky blue, blue, dark yellow.

Pillar 3: Near sec-5 Temple

TH= 100 inches

BH(U)= 14 inches

BH(B)= 27 inches

SC= 16 inches

BC(U)= 26 inches

BC(B)= 40 inches

COLOR= Orange, green, yellow

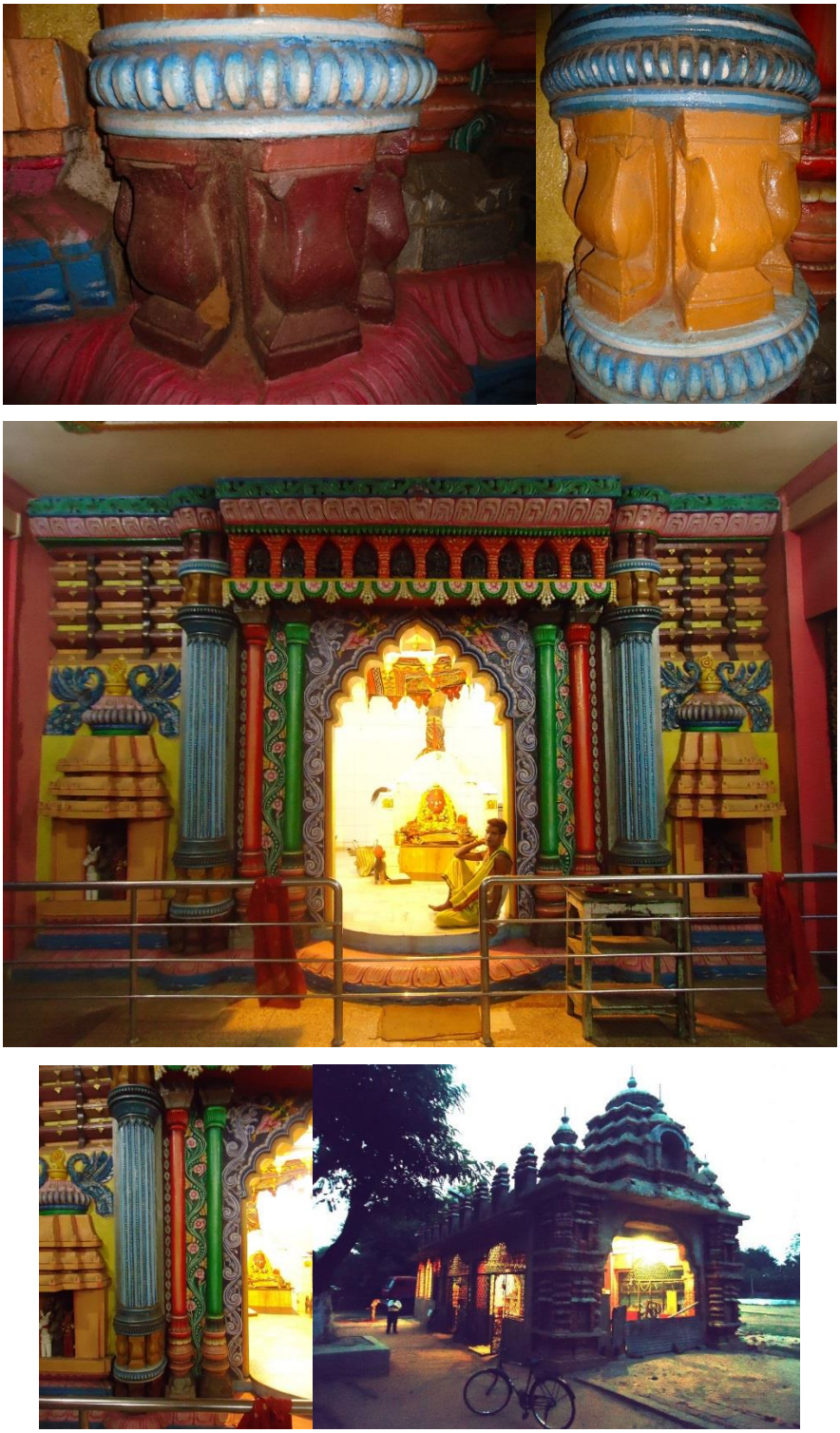

Fig 3.2 Temple and Pillar 2 and 3

Pillar 4: Hanuman Mandir, near Ambagan, Rourkela

TH= 90 inches

BH= 36 inches

SC= 40 inches

BC= 48 inches

COLOR= Black and yellow

Fig 3.3 Temple and Pillar 4

Pillar 5: Kali Mandir, Koel Nagar

TH= 71 inches

SC= 32 inches

BH= 7 inches

BC= 36 inches

Colour= White, green, yellow, black, blue

Pillar 6: Kali Mandir, Koel Nagar

TH= 68 inches

SC= 38 inches

BH= 17 inches

BC= 60 inches

Colour= Yellow, Orange, pink

Fig 3.4 Temple and Pillar 5 and 6

Pillar 7: Koel Nagar Mandir

TH= 84 inches

SC= 22.5 inches

BH(U)=13 inches

BH(B)= 27 inches

BC(U)= 36 inches

BC(B1)=40 inches

BC(B2)=64 inches

Colour= blue. Red. Green, white

Fig 3.5 Temple and Pillar 7

Pillar 8: Uncha Mandir, Koel Nagar

TH= 74 inches

SC= 27 inches

BC= 33 inches

BH(U)= 9 inches BH(B)= 14.5 inches

Colour= green, white, maroon, yellow.

Pillar 9: Uncha Mandir, Koel Nagar

TH= 78 inches

BC= 68 inches

SC= 48 inches

BH(U)= 12 inches

BH(B)= 21 inches

Colour= pink

Pillar 10: Uncha Mandir, Koel Nagar

TH=78 inches

BC= 68 inches

SC= 56 inches BH= 21 inches

Colour= pink

Pillar 11: Uncha Mandir, Koel Nagar

TH= 126 inches

SC= 52 inches

Colour: white, blue, maroon

Pillar 12: Uncha Mandir, Koel Nagar

TH= 78 inches

BC= 68 inches

SC= 48 inches

BH(U)= 12 inches

BH(B)= 21 inches

Colour= Pink

Fig 3.6 Temple and Pillar 8, 9, 10, 11 and 12

Fig 3.6 Temple and Pillar 8, 9, 10, 11 and 12

Pillar 13: C-Block temple, Koel Nagar

TH= 120 inches

SC= 40 inches

BH= 32 inches

BC= 90 inches

Colour= White

Pillar 14: C-Block temple, Koel Nagar

TH= 105 inches

SC= 48 inches

BC= 52 inches

BH= 64 inches

Colour= Black, white

Fig 3.7 Temple and Pillar 13 and 14

Pillar 15: B-Block Temple, Koel Nagar

TH= 90 inches

SC= 27 inches

BC= 33 inches

BH= 10 inches

Colour= blue, red, brown

Pillar 16: B-Block Temple, Koel Nagar

TH= 104 inches

SC= 38 inches

BH= 9 inches

Colour= white, green, maroon

Pillar 17: B-Block Temple, Koel Nagar

TH= 104 inches

BH(U)40 inches

BH(B)= 20 inches

BC= 46 inches SC= 36 inches

Colour= pink, maroon

Fig 3.8 Temple and Pillar 15, 16 and 17

Pillar 18: NSC Market temple, Rourkela

TH= 90 inches

BH= 9 inches

SC= 40 inches BC= 46 inches

Colour= yellow

Pillar 19: NSC Market temple, Rourkela

TH= 90 inches

C= 24 inches

Colour= White, orange

Fig 3.9 Temple and Pillar 18 and 19

Pillar 20: Sec-19 Temple, Rourkela

TH= 130 inches

BH(B)= 50.5 inches

BH(U)= 40 inches

BH(M)= 21 inches

SC= 75 inches BC= 110 inches

Colour= Brown

Pillar 21: Sec-19 Temple, Rourkela

TH= 125 inches

BC= 98 inches SC= 90 inches

BH(B)= 40.5 inches BH(M)= 18 inches BH(U)= 40 inches

Colour= Brown

Pillar 22: Sec-19 Temple, Rourkela

TH= 115 inches

BC= 60 inches

SC= 40 inches

Colour: Brown

Pillar 23: Sec-19 Temple, Rourkela

TH= 140 inches

BC= 68 inches

SC= 52 inches

Colour= Brown

Pillar 24: Sec-19 Temple, Rourkela

TH= 140 inches

BC= 108 inches

SC= 94 inches

Colour= Brown

Fig 3.10 Temple and Pillar 20, 21, 22, 23 and 24

Fig 3.10 Temple and Pillar 20, 21, 22, 23 and 24

Pillar 25: Gayatri Mandir, Sec-18 Rourkela, Odisha

TH= 42 inches

SC= 19 inches

BC= 23 inches

Colour= Green

Pillar 26: Gayatri Mandir, Sec-18 Rourkela, Odisha

TH= 84 inches

SC= 31 inches

BC= 38 inches

Colour= green, white, yellow, orange

Pillar 27: Gayatri Mandir, Sec-18 Rourkela, Odisha

TH= 105 inches

BH= 14 inches

SC= 38 inches

BC= 44 inches

Colour= black, white, yellow, maroon

Fig 3.11 Temple and Pillar 25, 26 and 27

Pillar 28: Hanuman Vatika Temple, Rourkela

TH= 130 inches

SC= 110 inches

BC= 160 inches

BH(B)= 54 inches

BH(U)= 36 inches

BH(MB)= 21 inches

BC(MB)= 260 inches

Colour= light brown

Pillar 29: Hanuman Vatika Temple, Rourkela

TH= 110 inches

SC= 56 inches

BH= 20 inches

BC= 68 inches

Colour= light brown

Pillar 30: Hanuman Vatika Temple, Rourkela

TH= 130 inches

BH= 25 inches

SC= 80 inches

BC= 96 inches

Colour= light brown

Pillar 31: Hanuman Vatika Temple, Rourkela

TH= 84 inches

SC(U)= 100 inches

SC(B)= 68 inches

Colour= maroon, black

Pillar 32: Hanuman Vatika Temple, Rourkela

TH= 80 inches

SC= 30 inches

BC= 41 inches

BH= 16 inches

Colour= yellow, red, pink

Pillar 33: Hanuman Vatika Temple, Rourkela

TH= 110 inches

SC= 56 inches

BC= 64 inches

BH= 9 inches

Colour= brown

Pillar 34: Hanuman Vatika Temple, Rourkela

TH= 110 inches

SC= 37 inches

BC(B)=56 inches

BH(B)= 40 inches

BH(U)= 27 inches

Colour= brown, pink, green, red, yellow, white

Pillar 35: Hanuman Vatika Temple, Rourkela

TH= 110 inches

SC= 37 inches

BC= 56 inches

BH(B)= 27 inches

BH(U)= 32 inches

Colour= orange, brown

Pillar 36: Hanuman Vatika Temple, Rourkela

TH= 100 inches

SC= 48 inches

BC= 68 inches

BH= 8 inches

Colour= orange, brown

Pillar 37: Hanuman Vatika Temple, Rourkela

TH= 110 inches

SC= 40 inches

BH= 28 inches

BC= 76 inches

Colour= Bluish white, sky blue, red, gprehistoricen

Fig 3.12 Temple and Pillar 28, 29, 30, 31, 32, 33, 34, 35. 36, and 37

Fig 3.12 Temple and Pillar 28, 29, 30, 31, 32, 33, 34, 35. 36, and 37

Fig 3.12 Temple and Pillar 28, 29, 30, 31, 32, 33, 34, 35. 36, and 37

CHAPTER 4
CONCEPTUALIASATION AND DESIGN

Based on the result and analysis on of the Rourkela temple pillars, a few concept and design of pillars has been generated after categorisation on broad categories and design has been generated according to them. CAD model of pillars or pillar has been made in this.

4.1 Pillar Design 01:

It's a square cross-sectional pillar which is tapered. This design of pillar is inspired from the pillars in prehistoric time which were tapered. The wheel and chakra are implemented in this design as outer design.

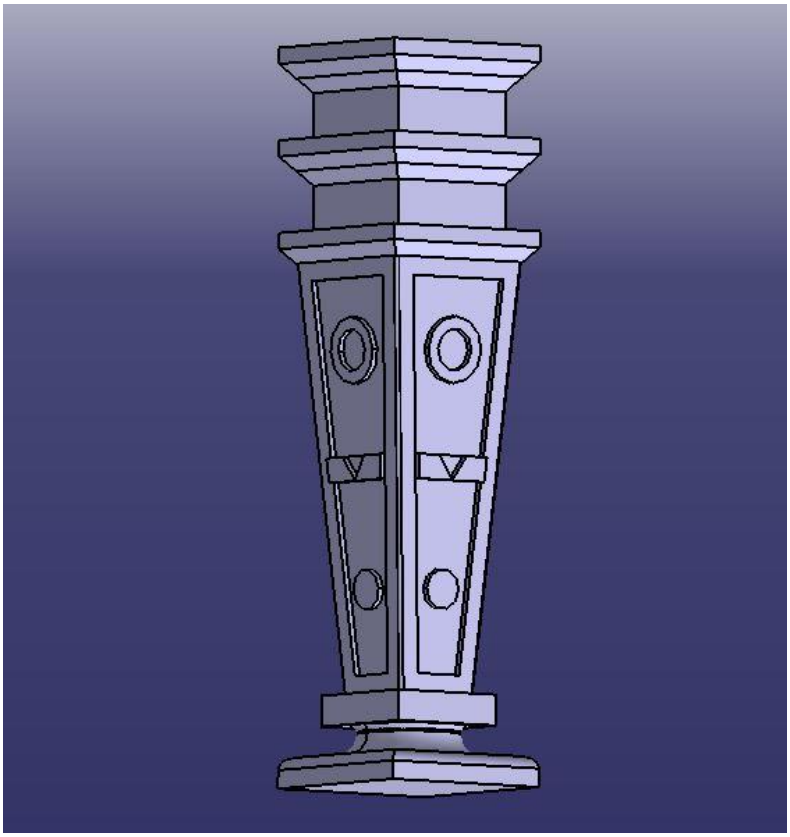

Fig 4.1 Pillar Design 01

4.2 Pillar Design 02:

It's a square cross-sectional pillar with liner or straight length. The pillar is elegantly designed. So many small rods implanted in the design increases its shock absorption power.

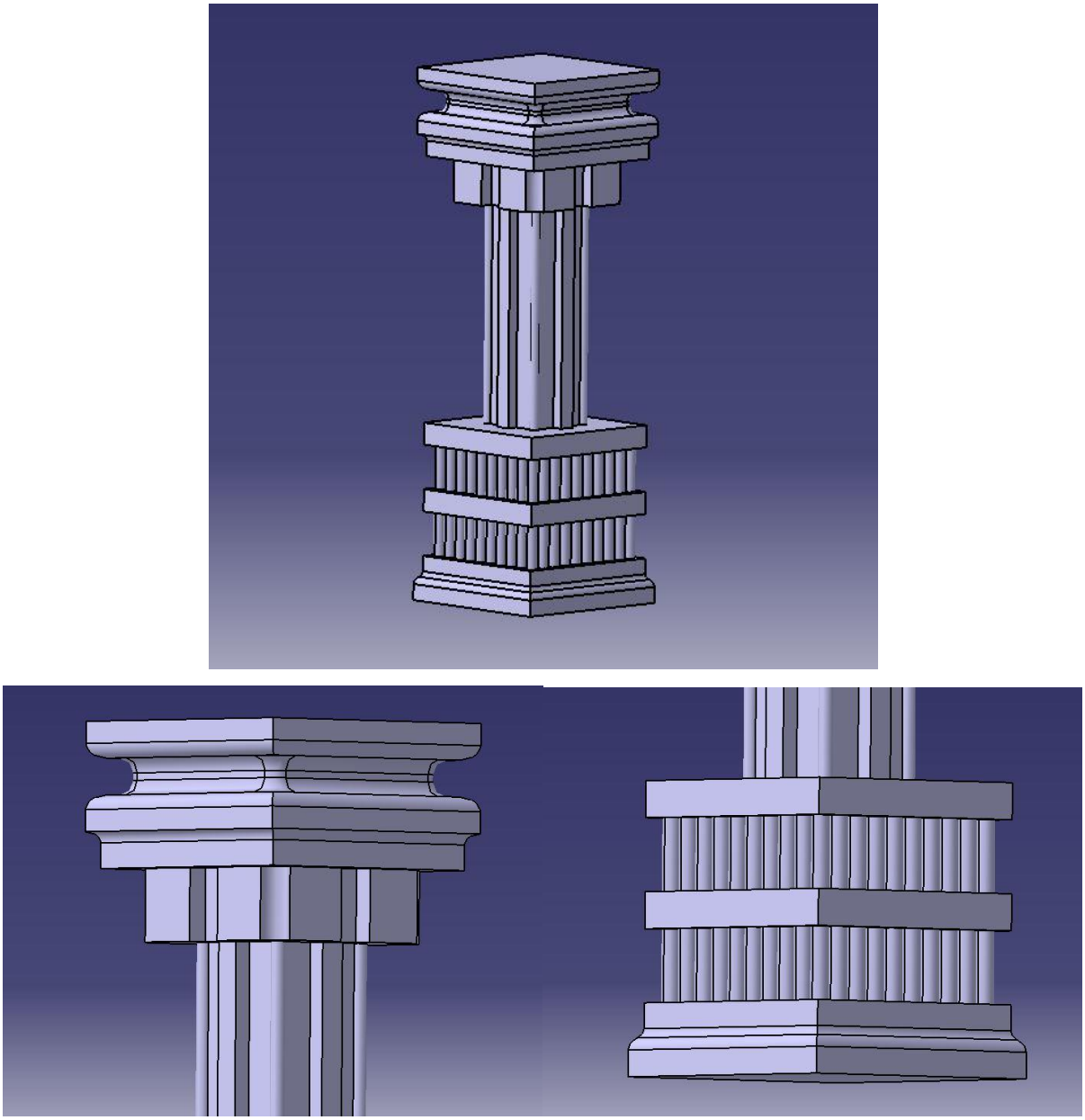

Fig 4.2 Pillar Design 02

4.3 Pillar Design 03:

It’s a round or circular cross-sectional pillar having bell shape or tapered shape in length which is increasing its power in seeing.

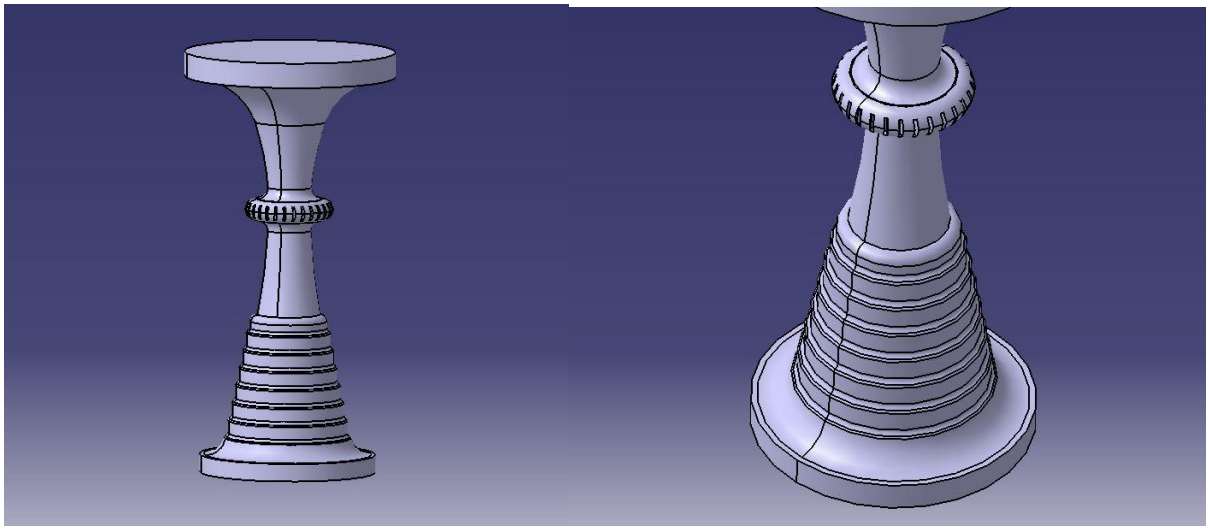

Fig 4.3 Pillar Design 03

4.4 Pillar Design 04:

It's a circular or round cross-sectional pillar or pillar having straight or linear length. Flutes are included in this design and overall this design is inspired from prehistoric temple's pillars.

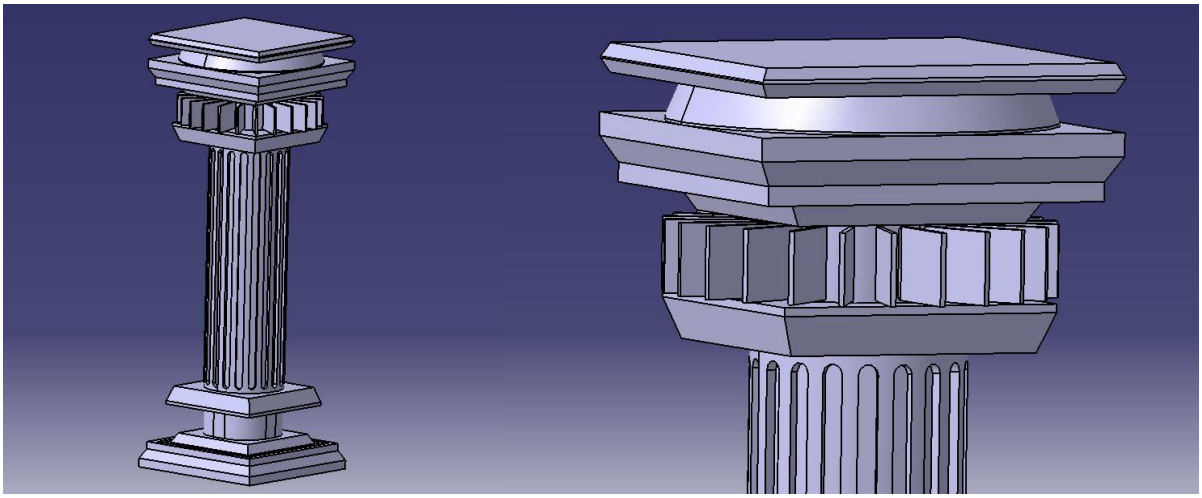

Fig 4.4 Pillar Design 04

4.5 Pillar Design 05:

It is a square cross-sectional shaft possessing pillar. The base and capital are having both square and round shape with design complexity in it. The pillar is straight or linear one. It is having extra-long rods which is providing extra support and increasing its architecture beauty.

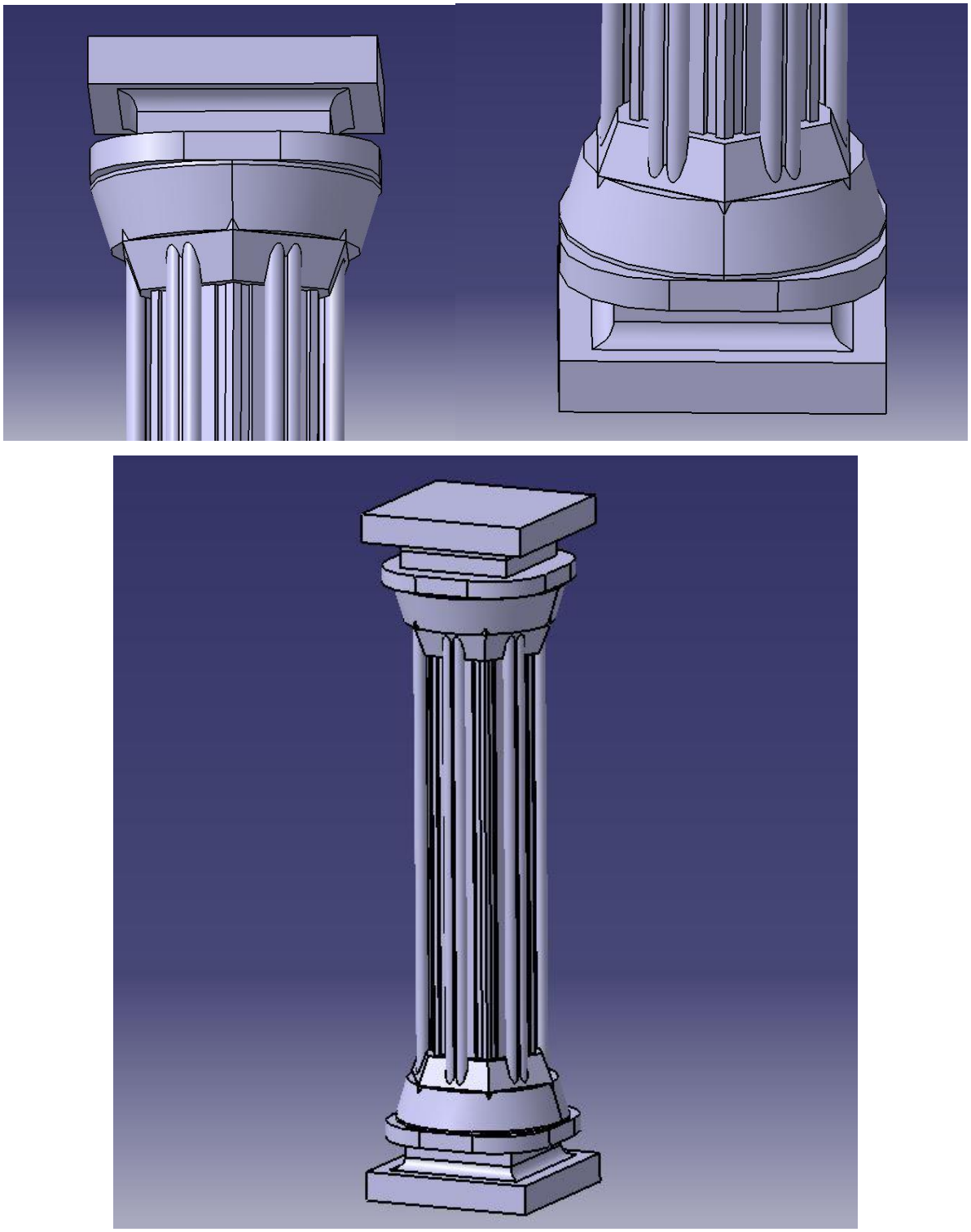

Fig 4.5 Pillar Design 05

4.6 All Pillars under same roof:

A structure is made supported by all the designed pillars. The structure is made in the orientation of polygon. It is supported by all five pillar designed earlier. Different figures are illustrated below from different vantage points.

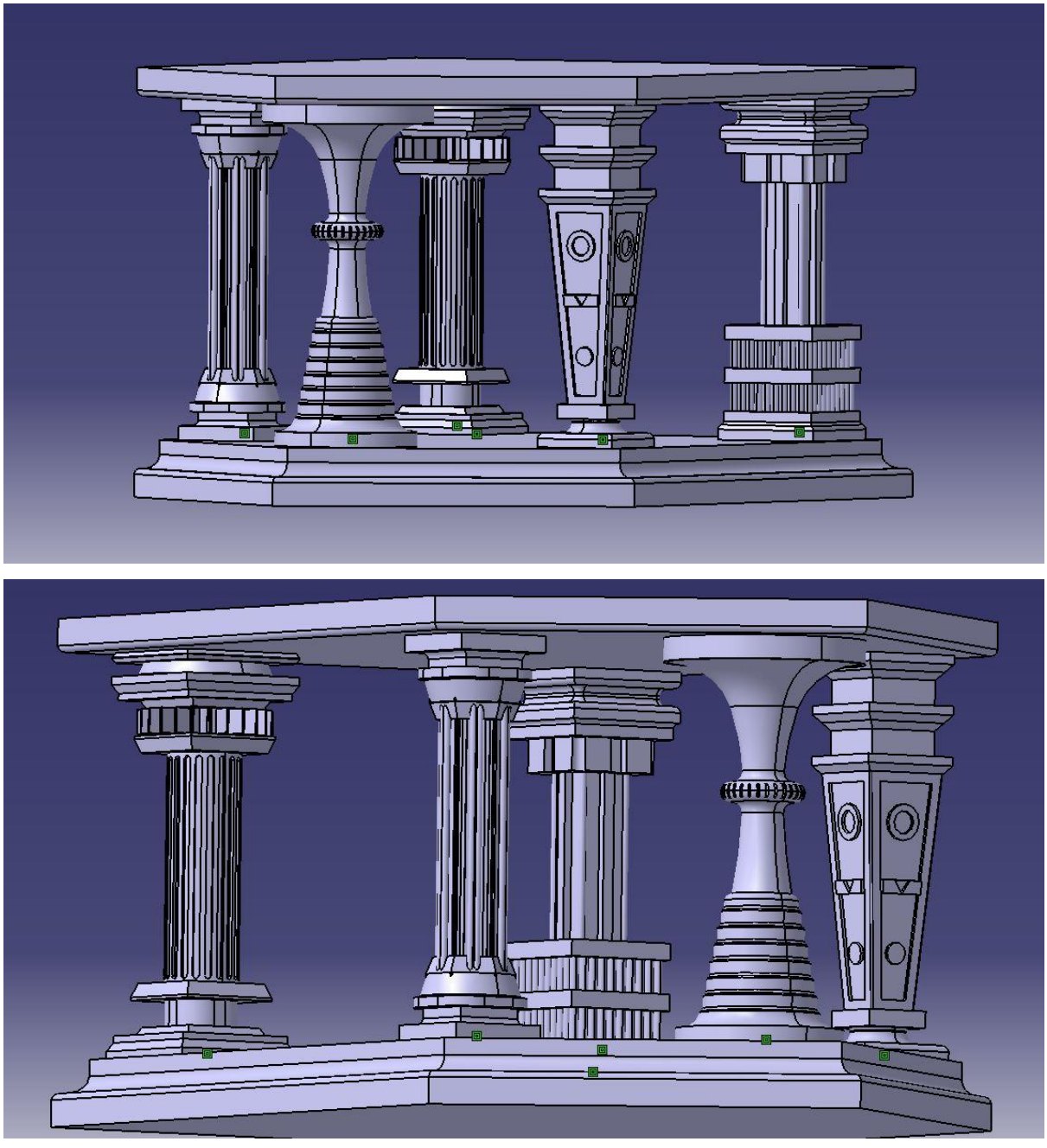

Fig 4.6 All Pillars under same roof

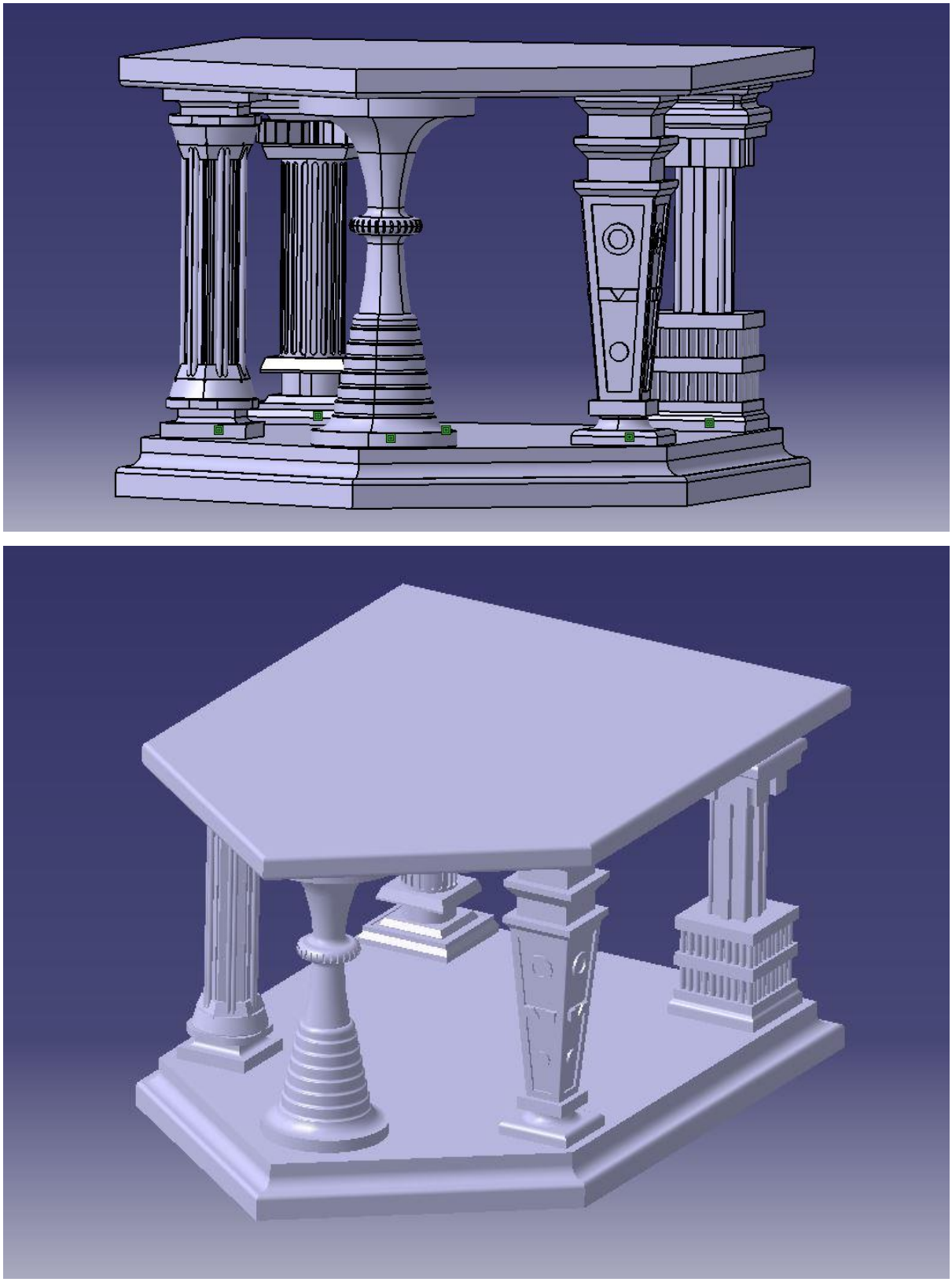

Fig 4.6 All Pillars under same roof

CHAPTER 5

CONCLUSION

Pillar is one of the most important elements in Architecture and interior design that we can see through the history till now in different ways of expression, navigating between structural, functional, esthetics and symbolic need. Design of any product require research and study of the things related to particular product. I did research on most types of pillar existed in history of Indian or Western culture and architecture. I studied types of order present in western architecture and Parts and nomenclature of pillars. Famous and rich architecture pillars of Indian temple were studied in this project and categorisation is done. Parameters from them are used in the designing of pillars. I did study on the pillars of temples of Rourkela City in Odisha state of Country India. I took Photograph of almost all the pillars in Rourkela which are rich in architecture and did measurement on them and noted their parameters and specific factors and qualities.

This research analyzed the columns or pillars as a vital part or element in architecture, aesthetic design and interior design of building, monuments and structures. The research include the evolution, development and alteration done on pillars time to time by various groups. The illustration of its development from prehistoric time to present time has been done focusing on the aesthetical, ornamental, artistic, functional and structural elements. The results have been found that in present time also pillars are an integrated part of our design, art and architecture in people life. The research has been done on type of Western and Indian pillars and their elements. Through the study of various examples, the study found that the pillars, through the historical development used as a main purpose to support roof, but over time and found pillars bearing roof symbolically, Here comes the psychological factor and expertise in the sense of the role of pillar supporting, in other words, it is not necessary to have a roof for pillar existing. The study found, through the evolution of pillar from of its inception through classic period and modernity to this day that the pillar went through different issues:

- Different forms.
- Different materials.
- Supporting pillars and non-supporting pillars.
- Roof existing and non-roof existing.

CAD models have been generated using CATIA keeping all the attributes and factors in mind and CAD model is then further be used for rapid prototyping and a prototype of the structure having all the pillars under one roof is generated using 3D printing method.

5.1 Scope for future Work:

In this project, we have done wide research on the Western and Indian pillars of temple and we have taken Rourkela city of India to study and generated CAD models. In future we can work on this project in a wide field because of its wide scope of work in future. In future the project can be done in different angle such as

- Categorization of pillars can be done on different criteria and on the same criteria their nomenclature can be done.
- We can do categorize on the basis of state wise temples in India and do research as done in Rourkela in this project.
- We can take people's opinion and their stereotype about pillars emotion wise and do survey on that and then design pillars according to that.
- Collection of all the data from all the pillars of temple in India.
- Research on connection of Indian and western pillars can be done.

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